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Effectivess of chair stand exercise along with conventional therapy vs resistance training along with conventional therapy for managing sarcopenia in hemiparetic stroke patients

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Abstract
Sarcopenia; disease stated by qualitative, quantitative degeneration of skeletal muscle with decline in muscle strength. sarcopenia in hemiparetic stroke; one quarter of hemiparetic stroke patients experience moderate motor disability within 4 hours after stroke leads to motor unit reduced in skeletal muscle. Chair stand exercise as complete body resistance training; it is an intervention builds strength and balance in muscle involved during sit to stand. The aim of this study to analyze the effect of chair stand exercise along with conventional therapy vs resistance training along with conventional therapy for managing sarcopenia in hemiparetic stroke patients.

Objective: With comparison of chair stand exercise along with conventional therapy vs resistance training with conventional therapy on improving strength, power. Independent variable; chair stand exercise, resistance training, conventional therapy. Dependent variable; strength, power, balance, quality of life.

Method: A quasi -experimental Study carried out among 20 patients diagnosed with hemiparetic stroke male and female were included. patients' selection is connected with SARC-F subjective questionnaire score ≥4 were selected and divided into two groups; Group A [n=10] receives chair stand exercise with conventional therapy; Group B [n=10] receives resistance training with conventional therapy. The outcome is measured by berg balance scale, activity of daily living [ADL], SARC- F subjective questionnaire. This protocol last for 4 weeks. This quasi-experimental study found that both chair stand exercise with conventional therapy and resistance training with conventional therapy are effective in improving sarcopenia in stroke patients, as measured by SARC-F, Berg Balance Scale, and Barthel Index. However, chair stand exercise combined with conventional therapy (Group A) showed significantly greater effectiveness.

Keywords: Sarcopenia, SARC-F, Hemiparesis, Berg balance scale, Stroke, Quality of life, chair stand exercise, resistance training

Introduction

Stroke is defined by the World Health Organization (WHO) as a rapidly developing clinical syndrome of focal cerebral dysfunction, persisting for more than 24 hours or leading to death, with vascular causes as the primary aetiology [1]. Globally, stroke continues to be a leading cause of death and disability. The Global Burden of Disease (GBD) study identified stroke as the second leading cause of mortality in 1990, reporting 5.87 million deaths in 2010 compared to 4.66 million in 1990 [2, 3]. In India alone, incident stroke cases were estimated to exceed 1.1 million in 2016 [4]. Outcomes after stroke, are influenced by lesion site, collateral blood flow, and early acute care, yet more than 60% of survivors remain disabled, 50% experience hemiparesis, and about 30% cannot walk independently [5]. Stroke subtypes include ischemic, haemorrhagic, transient ischemic attack, cryptogenic, and brainstem stroke, each with distinct clinical features [6].

Sarcopenia characterized by the progressive loss of skeletal muscle mass, strength, and physical function has recently been recognized as a disease entity with an ICD code [7]. The prevalence of stroke-related sarcopenia ranges from 14% to 54%, depending on region and population [8]. Unlike age-related sarcopenia, stroke-induced muscle loss results from denervation, disuse, spasticity, and remodelling, with changes observed as early as four hours

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post-infarction [9]. These structural and functional impairments worsen disability and affect both the paretic and non-paretic limbs [9].

Management strategies for post-stroke sarcopenia include nutritional supplementation, amino acids, vitamin D, and structured exercise interventions [10]. Among non-pharmacological approaches, resistance training is well established as an effective first-line strategy to improve muscle mass, strength, and performance [11]. Evidence shows that mixed exercise programs combining resistance and balance training yield superior functional outcomes compared to resistance training alone, particularly in activities of daily living and fall prevention [12]. Chair-stand exercise, which mimics sit-to-stand transitions, has been reported to improve not only lower-limb strength and balance but also swallowing function, continence, and rehabilitation outcomes in post-stroke patients [13, 14].

Recent trials highlight the broader benefits of targeted rehabilitation: high-speed power training (HSPT) improves type II muscle Fiber activation in sarcopenic stroke survivors [15], and inspiratory muscle training (IMT) has been shown to reduce the incidence of post-stroke sarcopenia, improve balance, and enhance respiratory strength [16]. Furthermore, combining exercise with nutritional strategies such as amino acid or whey protein supplementation, with or without vitamin D, enhances recovery potential [17, 18]. the present study aims to compare the effects of chair-stand exercise and resistance training, alongside conventional therapy, on sarcopenia outcomes in stroke patients, using validated measures such as the SARC-F, Berg Balance Scale, and Barthel Index.

Materials and Methodology
Materials used
The following tools were utilized for intervention and assessment: Scoring sheet, Pen, Chair with arm rest, TheraBand.

Study design and setting and duration
The study design was a quasi-experimental study. It was conducted at the department of physiotherapy, Sri Ramakrishna Hospital, under the supervision of guide, College of physiotherapy, SRIPMS, Coimbatore over a period of 6 months. duration of treatment was 20 mins per session, 1 session per day, throughout the week is continued for about 4 weeks

Participants and sampling
The patients assigned for this study were sampled as non-probability purposive sampling by using SARC-F subjective questionnaire. 20 patients were selected to this study, and they divided into two groups.
Group A- 10 patients receive chair stand exercise along with conventional therapy.
Group B- 10 patients receive resistance training along with conventional therapy.

Inclusion criteria
- Age 40 to 60 yrs patients were included.
- Both male and female are selected.
- SARC-F subjective score ≥ 4 taken for the study.

- Unilateral hemiparetic stroke patients were taken.
- All types of stroke patients are included.

Exclusion criteria
- Below 40 ages of stoke patients are excluded.
- SARC score less than 4 are not taken.
- Cognitive impairment patients are not included.
- Uncooperated patients are not taken to study.
- Unwilling patients are not included.

Variables
Independent variable: Chair stand exercise with conventional therapy, Resistance exercise with conventional therapy.

Dependent variable: Strength, Power, Endurance, Balance, Quality of life.

Outcome Measures
- SARC -F subjective questionnaire: To measure the risk of sarcopenia
- Barthel index: To improve the quality of life.
- Berg balance scale: To assess the balance of patient

Treatment Procedure
Prior to the intervention, the study purpose and procedure were explained to all participants, and baseline vital signs were assessed. A total of 20 patients were recruited based on the SARC-F subjective questionnaire and specific inclusion and exclusion criteria. Participants were randomly allocated into two groups (n = 10 each). Baseline assessments of balance and coordination were conducted before the intervention.
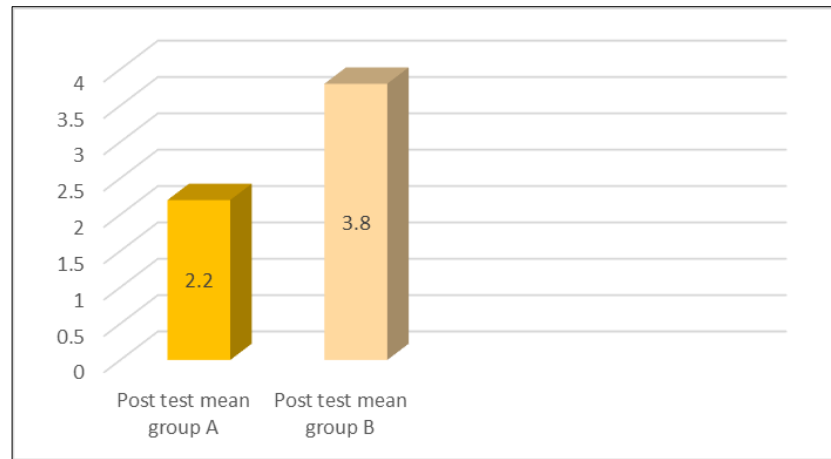- **Group A**: Participants in this group underwent a 20-minute chair stand exercise protocol. Based on individual ability, participants were instructed to repeatedly sit and stand from a chair without using arm support, unless necessary. The total number of sit-to-stand repetitions within 20 minutes was recorded. Rest breaks were permitted if required.
- **Group B:** received resistance training with conventional therapy, performing upper and lower limb exercises using TheraBand for 20 minutes.

Conventional therapy: included active limb movements, strengthening (5–10 repetitions), pelvic bridging (5–10 repetitions), and balance/coordination training. Both groups underwent daily sessions, five days per week, for four weeks.

Statistical Analysis
Pre-test and post-test values of the study were collected and assessed for variations in improvement and their results were analysed using independent t test and parried t test. The statically analysis of the study showed that there is a significant difference between the group in strength and power and to identify sarcopenia with a t value of SARC-F questionnaire, berg balance scale and Barthel index.
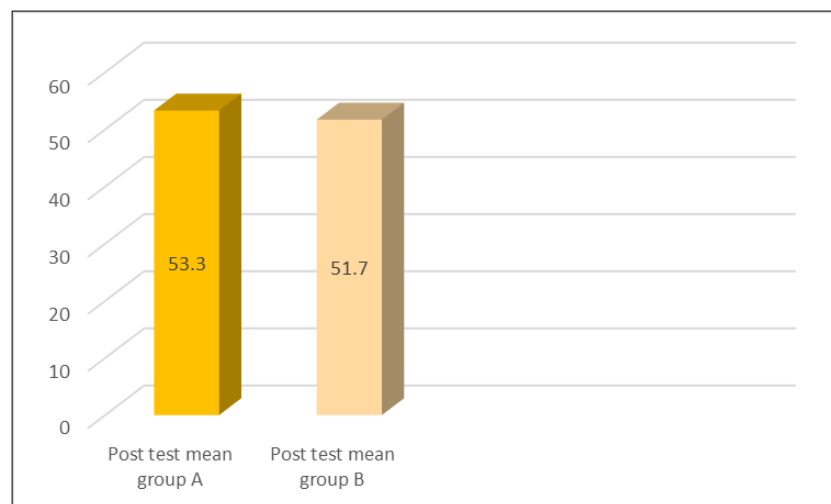
Result

Graph 1: Comparison of SARC-F questionnaire score in Group A and B

When measured with the SARC-F subjective questionnaire the group A dependent t value is 29.53 and group B dependent t value is 25.70 by comparing these two values group A is effective. And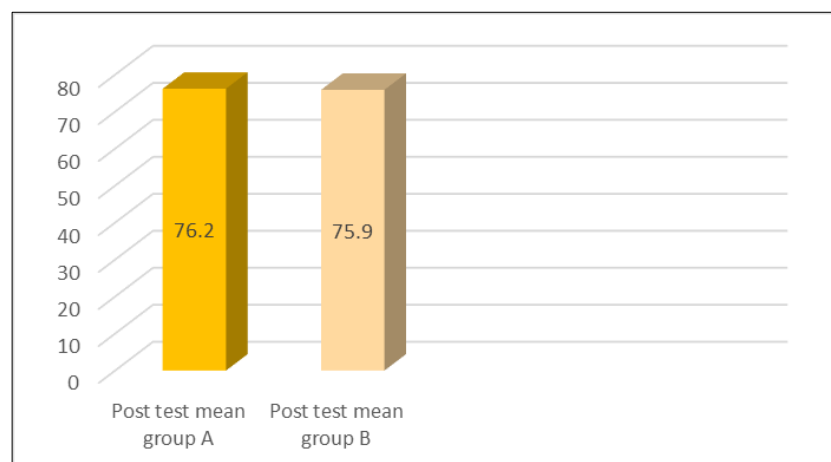 calculating the independent t test the group A mean is 2.2 and group B is 3.8 and the mean difference is 1.6 and the P value is 0.05 and independent t value is 3.98 by calculating table t value for one tailed the independent table t value is 1.734.

Graph 2: Comparison of berg balance scale in Group A and Group B.

When measured with the berg balance scale the group A dependent t value is 47.969 and group B dependent t value is 27.565 by comparing these two values group A is effective. And calculating the independent t test the group A mean is 53.3 and group B mean is 51.7 and the mean difference is 3.2 and the P value is 0.05 and independent t value is 2.118 by calculating the table t value for one tailed the independent table t value is 1.734.

Graph 3: Comparison of Barthel index scale in group A and group B

When measured with the Barthel index the group A dependent t value is 36.976 and group B dependent t value is 22.365, by comparing these two values the group A is effective. And calculating the independent t test the group A mean is 76.2 and group B mean is 75.9 and the mean difference is 0.3 and the p is 0.05 and independent t value is 2.894 by calculating in the table t value for one tailed the independent table t value is 1.734.

Discussion

Stroke is a rapidly developed clinical signs of focal disturbance of cerebral function, which is lasting more than 24 hours or leading to death, with no apparent cause of vascular origin. More than 60% of patients remains disabled, 50% of people suffer from some hemiparesis and 30% remains unable to walk without assistance. The prevalence of stroke related sarcopenia reaches from 14% to 54% it remains unnoticed in penitents. Sarcopenia is a disease characterized by quantitative and qualitative degeneration of skeletal muscles. The study was aimed to analyze the effect of chair stand exercise vs resistance training along with conventional therapy in hemiparetic stroke patients. A total 20 patients were taken to the study and divided into two groups:

Group A = 10 patients, Group B =10 patients. The 20 patients were taken to study based on the SARC-F subjective questionnaire if the patients score ranges from ≤4 are taken.

Group A given with the intervention of chair stand exercise along with conventional therapy and Group B given with the intervention of resistance training along with conventional therapy, while comparing the mean values of group A and group B, there is a significance difference existing between two groups. By taking consideration of mean values, the study is concluded that chair stand exercise along with conventional therapy shows more effective intervention to treat sarcopenia in stroke patients in hemiparetic stage

Yoshihiro Yoshimura, ai Shiraishi, *et al*., suggested chair stand exercise improves the muscle strength and endurance day by day, by doing the chair stand exercise as a whole body resistance training it improves the SARC-F subjective questionnaire score and this decreasing the effect of sarcopenia [10].

Nadja Scherbakov, Wolfram Doehner suggested resistance training also improves the sarcopenia by building the strength and balance and quality and life. Though comparing these two the chair stand exercise along with conventional could be effective [6].

In all measured outcomes, the null hypothesis was rejected, indicating statistically significant differences between the groups. Group A consistently showed greater improvements in SARC-F subjective questionnaire, Barthel index and berg balance scale. function, compared to Group B. These findings confirm that chair stand exercise along with conventional therapy is more effective than resistance training along with conventional therapy for optimizing treatment protocols for sarcopenia in hemiparetic stroke patients.

Conclusion

This quasi-experimental study showed that Chair stand exercise along with conventional therapy and resistance training along with conventional therapy are highly effective intervention of sarcopenia in stroke patients on SARC-F subjective questionnaire, berg balance scale and Barthel index score on individual basis. But comparatively chair stand exercise along with conventional therapy (Group A) is more effective than resistance training along with conventional therapy (Group B) as there is significant difference found between the results of these treatments

Declaration by Authors
Ethical Approval
Ethical approval was obtained from the institutional review board of Sri Ramakrishna institute of paramedical sciences. All respondents agreed to participate in the study and informed consent was obtained from all the subjects. The privacy of the participants information was maintained, and there was no disclosure of their names or any information that could identify them.

Conflict of Interest
The authors declare no conflict of interest.

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